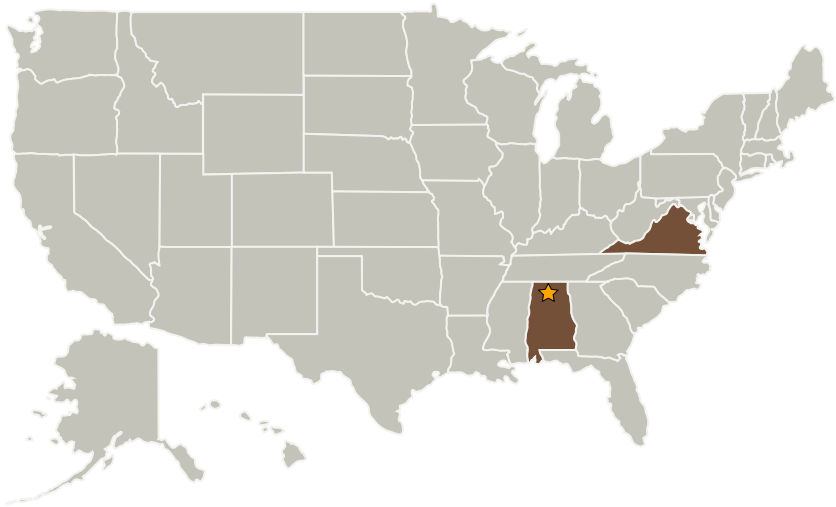
Nanostructured Fiber Optic Cantilever Arrays and Hybrid MEMS Sensors for Chemical and Biological Detection, Phase II

Completed Technology Project (2005 - 2007)

Project Introduction

Advancements in nano-/micro-scale sensor fabrication and molecular recognition surfaces offer promising opportunities to develop miniaturized hybrid fiber optic and MEMS-based sensors for in situ analysis of chemicals and microbial pathogens in spacecraft air and water. Such sensors have extraordinary dual-use benefits in medical screening for early indication of certain cancers and rapid detection of weaponized chemical and biological agents for homeland defense. Returning humans to the moon and "worlds beyond" as directed in the 'Vision for Space Exploration' requires manned missions of increasing duration. Increased mission duration invariably increases chemical and microbial contamination of spacecraft. Ensuring crew health and optimal systems performance thus requires sensors to continuously monitor spacecraft advanced life support systems. Presently, adequate sensors do not exist and crews must rely on labor-intensive techniques to ensure safety of drinking water and breathing air. In Phase I we demonstrated feasibility of miniaturized polymer-coated fiber-optic cantilever arrays for monitoring toxic vapors. In Phase II we will develop next-generation hybrid cantilever and MEMS sensors for detection of various aerosolized chemical and biological contaminants at SMAC-relevant levels. To facilitate implementation by NASA end-users, sensors will be integrated and demonstrated with existing NASA air sampling devices. Phase III commercialization efforts are well underway.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Luna Innovations, Inc.	Supporting Organization	Industry	Roanoke, Virginia

Primary U.S. Work Locations	
Alabama	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic